SECTION VII – WATER

VII-1. DESIGN GUIDELINES

A. General

Water pipelines and appurtenant structures within the jurisdiction of the City of Paso Robles shall be designed and constructed in accordance with the details shown on the plans and specifications and as approved by the City Engineer.

B. Design Flow

Water pipelines shall be designed such that water supply can be adequately delivered under maximum consumption. In most cases, the maximum demand is for fire flow. As a general guide, the following fire flow demands shall be considered:

1. **Residential Single Family Dwelling -** A total of 2,000 to 2,500 gallons per minute (gpm) (7570 liter/minute to 9463 liter/minute) (or as required by the City Engineer) for detached units or 2,500 to 3,500 gpm (9463 liter/minute to 13,248 liter/minute) for attached units from any two adjacent hydrants at a minimum of 20 pounds of residual pressure at the main.

2. **Schools and Commercial Areas -** A total of 3,500 gpm (or as required by the City Engineer) out of any three (3) adjacent hydrants at a minimum of 20 pounds of residual pressure at the main.

3. **Industrial Areas -** A total of 6,000 gpm (or as required by the City Engineer) out of any three (3) adjacent hydrants or a minimum of 1,500 gpm out of any single hydrant at a minimum of 20 pounds of residual pressure.

C. Distribution System

The distribution system, wherever possible, shall be in grid form so that pressures throughout the system tend to become equalized under varying rates and locations of drafts. Dead end mains shall not exceed 1,000 Lineal Feet (304.8m). The design and installation of the water system must be compatible to serve the ultimate service area in accordance with the General Plan.

Water distribution systems shall be designed to maintain normal operating pressures of not less than 40 psig at the service connection. If pressure at connection is 80 psig or higher a pressure regulator will be required on the structure being served as outlined in the Uniform Building Code. Concrete anchors or thrust blocks shall be provided at all bends per **Standard Drawing No. G-5,** at the end of plugged mains, behind tees and fire hydrants, and behind crosses which are valved in such a manner that they can be used as tees.

D. Regulations Relating to Cross Connections

Reference is also made to Title 17, Chapter V, Sections 7583-7622 inclusive of the California Administrative Code, regulating the construction of cross connections between drinking water systems and other sources of water. All construction shall be in strict compliance with said regulations.

In the interest of public health and to minimize the possibility of contamination of the public water supply, special construction requirements shall be met at any time that the separation between water and sewer lines is less than that described in **Drawing No. G-17 and G-18** of these Standards. These requirements apply to construction of a water main, sewer main, sewer lateral, or any other type construction causing the separation to be less than minimum standard. All special construction required is to be discussed thoroughly with the City Engineer prior to staring any design work and is subject to the City Enginee's approval. Special construction requirements shall be as outlined in "Criteria for the Separation of Water Mains and Sanitary Sewers" written by the State Department of Health Services.

E. Minimum size

In general, the minimum size pipe shall be not less than 8 inches (203.2mm) inside diameter. The installation of six inch (152.4mm) mains should be limited to cul-de-sacs or courts where extension of the main is not feasible. In dead end mains, where it is not served by a fire hydrant, smaller size mains may be allowed as determined by the City Engineer.

F. Depth

Water mains shall be installed at a depth which will provide a minimum cover of 36 inches (914.4mm) over the top of the pipe measured from the finished grade. Mains 12 inches (304.8mm) and larger shall have minimum cover of 48 inches (1219.2mm).

G. Water Valving

As a general rule, there should be two control valves where one main ties into another. Where two mains cross, there should be three valves, and there shall be four valves at a major distribution point.

On long blocks, intermediate valves should be installed so that only a maximum of 600 feet (182.9m) would have to shut off at any one time.

Valves should also be spaced so that not more than two fire hydrants should be out of service at any one time.

In cases where water mains pass through easements outside traveled streets, a valve shall be located at each end of the easement.

H. Fire Hydrant Spacing

Fire hydrants shall be placed at street intersections whenever possible, and should be located to minimize the hazard of damage by traffic. They shall have a maximum normal spacing of 500 feet (152.4m) in residential areas and 300 feet (91.4m) in commercial and industrial areas, measured along the street frontage unless otherwise specified by the local fire protection agency. For subdivisions having lots greater than one acre, fire hydrants shall be placed at intervals not to exceed 1,000 feet (304.8m) in residential areas.

For commercial and industrial developments, 6-inch (152.4mm) stub outs shall be constructed from the main to the property lines to accommodate for future fire lines.

The minimum size main serving the fire hydrant shall be 6-inch (152.4mm) with a gate valve installed at the main as shown on **Drawing No. G-1.**

I. Service Lines

Service lines from the water main to the property line shall normally be installed at the time the main is constructed to avoid frequent cutting of the street. Service lines shall be a minimum of 1 inch (25.4mm) in inside diameter for domestic single family residential. Commercial, industrial, or irrigation service line sizes are to be as shown on the plans and as approved by the City Engineer.

J. Storage Facilities

All steel tanks, standpipes, reservoirs and elevated tanks for water storage shall comply with AWWA D100 and also meet all foundation and seismic requirements for Zone 4 development, as defined by the latest edition of the Uniform Building Code. Downstream of any reservoir shall be designed for protection against catastrophic tank failure. Where limited service life is satisfactory for a particular situation the, City Engineer may approve steel tanks which meets the standards of the American Petroleum Institute (A.P.I.).

VII-2. MATERIALS

A. General

The supplier shall furnish a certificate, stating that all pipe, valves, fittings, protective coatings and all other materials comply with the specifications in this manual.

B. Pipe

Pipe used in the construction of water distribution systems shall be either ductile iron, cast iron, or PVC and shall meet the standards of the American Water Works Association (A.W.W.A.) where applicable. The City Engineer may specify which types shall be used in any instance.

1. PVC pipe shall be a minimum of Class 150 and shall conform to and meet the requirements of AWWA Specification C900.

2. Ductile iron pipe shall be of a class equal to or better than AWWA C151.

C. Fittings

Bends, elbows, tees, crosses, and special fittings shall be cast iron or ductile iron, and shall conform to and meet requirements of AWWA Specification C110. At connections to adjacent pipe the fittings shall have rubber gasket push-on joints conforming to AWWA Specification C111. Fittings shall have flange type connections to any adjacent fittings.

D. Valves and Valve Boxes

Valves shall be epoxy lined and shall open in counter-clockwise direction and shall meet the requirements of AWWA Specifications C500 for gate valves. Valve boxes shall be as shown on Standard **Drawing No. G-4.** The cover shall be marked "WATER". All gate valves shall be resilient wedge type.

E. Fire Hydrants

Fire hydrants shall be as required per **Standard Drawing No. G-1.** When connecting to any pipe, all fire hydrants shall have grip restrainers.

F. Air and Vacuum Release Valves

Air and vacuum release valves shall be installed in the water system at all high points where it is indicated that air pockets may form. The design shall be such as to insure the release of air automatically from the water main. These valves may also insure the entrance of air into the water main when the pressure inside the line is below atmospheric pressure. All valves shall be designed for a minimum of 150 PSI operating pressure. The inlet to each valve shall be provided with a gate valve or corporation stop to provide a positive closure between the main pipeline and the air and vacuum release valve, and the air and vacuum release vent outlet shall be installed above ground in such manner as to preclude back-flow.

G. Check Valves

All check valves shall seat readily and completely to assure water tightness. The face of the closure element and valve seat shall be bronze, composition, or other non-corrodible material which will seat tightly under all prevailing conditions of field use.

Slow-closing check valves shall be used where excessive pressure or water hammer may occur, and the static operating pressure is within 20% of the pressure class or rating of the pipe. All check valves, 4-inch and larger in size, for use of distribution mains, shall be designed for a minimum of 175 PSI working pressure.

H. Blow-offs

All blow-offs shall be a minimum outlet size of 2" and shall be designed for a minimum operating pressure of 150 PSI. A blow-off or fire hydrant shall be installed at the terminus of all dead-end water mains or non-circulating flow water mains. (See **Standard Drawing No. G-14)**

I. Water Service Connections

1. **1-Inch Service -** Acceptable material for a 1-inch service connection is Polyethylene tubing (copper tube size CTS). They shall be tested and certified as suitable for use in potable water piping systems by the National Sanitation Foundation Testing Laboratory or another testing agency acceptable to the California State Department of Health Services.

   Note that polyethylene tubing is normally specified in outside diameter.

2. **2-Inch or Larger -** Acceptable material for 11/2-inch or larger service line is polyethylene tubing copper tube size or better or copper K-soft or better.

3. **Corporation Stops -** All corporation stops, if used, shall be bronze, round, with inlet for either corporation stop (C.S.) thread for cast-iron pipe, or iron pipe standard (I.P.S.) thread for steel pipe, and outlet for the type of service pipe used.

4. **Meter/Angle Stops -** All 3/4 inch and 1 inch (curb) meter stops shall be bronze, with inlet for the type of service pipe used, and outlet for the type of service pipe or meter coupling used.

   For 11/2 inch and 2 inch service, bronze curb stop valve, straight ground key curb stop, or bronze gate valve (Minimum of 200 PSI rated working pressure) may be used. Inlet and outlet shall be appropriate for the type of service pipe or meter flange used. All

valves shall be factory hydro-tested to 300 PSI or air-tested to 100 PSI under water-with locking assembly per Standard G-6.

5. **Bronze Gate Valves -** All 11/2 inch through 3 inch gate valves shall be all bronze and comply with AIWA C500.

6. **Standard Service Clamps -** All service clamps and straps shall be in accordance with AIWA Standards and the pipe manufacturer's recommendations.

7. **Repair Service Clamp** - Where no service clamp is required, and the corporation stop does not seal properly, a repair service clamp shall be used.

8. No splicing will be allowed for any polyethylene tubing from the water main to the valve or service unless approved by the City Engineer.

J. Vertical Turbine Pumps

All vertical turbine pumps shall comply with AWWA Standards.

VII-3. CONSTRUCTION GUIDELINES

A. Connection to Existing Mains

The City Engineer shall be given not less than 24 hours notice before any connection is to be made to any existing main, and all necessary Encroachment Permits, Rights-of-Entry, etc., shall first be obtained.

In general, shutdowns in residential and commercial areas shall be made at times when there will be the least interruption of service. Connections shall be made only after complete and satisfactory preparation for such work has been made, in order that the shutdown may be as short as possible.

The City will be responsible for all main valve operation. All hot-tapping shall be done under the observation of the City inspector. Drill bit for tapping tool shall be of cylinder type and able to recover all removed mainline material.

B. Excavation for Water Lines

The minimum trench width shall be the nominal diameter of the pipe plus twelve (12) inches, but in any case shall be ample to permit the proper installation of the pipe and appurtenances. All of the requirements as set forth in "Excavation for Sewers" and "Bracing and Shoring", shall apply to excavation for water mains. Upon approval by the City Engineer, tunneling for short distances under other utilities, sidewalks, etc., may be permitted.

Excavated material shall be piled in such a manner that it will not endanger the work and will offer minimum obstruction to traffic. Open trenches and waste piles shall be adequately barricaded and lighted.

All safety orders, rules, or recommendations of the occupational Safety and Health Administration (OSHA) and the Division of Industrial Safety of the Department of Industrial Relations of the State of California applicable to this work shall be obeyed and enforced.

C. Laying of Pipe

Each section of pipe and each fitting shall be thoroughly cleaned before it is installed. All pipe, fittings, valves, etc., shall be carefully lowered into the trench by suitable tools or equipment, in such manner as to prevent damage to the pipe, lining, coating, fitting or other appurtenances. Under no circumstances shall pipe or accessories be dropped into the trench.

The pipe shall be laid true to line, with no visible change in alignment at any joint, unless curved alignment is shown on the plans.

When curved alignment is shown on the plans the maximum deflection at any joint shall not exceed the manufacturer's recommendation for the type of pipe and joint being used.

Thrust blocks of Class "B" concrete shall be cast in place at bends of 111/4, 221/2, 45 or 90 degrees at the end of plugged mains. behind each tee or each cross which is valved in such a manner that it can act as a tee, and at the back of fire hydrants. The thrust block shall extend from the fitting to undisturbed soil, shall be kept clear of the joints, and shall be of such bearing area as to assure adequate resistance to the water pressure force to be encountered.

Whenever pipe laying is discontinued for short periods, or when work is stopped at the end of the day, the open ends of all mains shall be closed with water-tight plugs or bulkheads. The plug or bulkhead shall not be removed unless or until the trench is dry.

Gate valves shall be set plumb, supported on a concrete base and properly fitted to the adjacent sections of main. A valve box shall be installed over each valve.

Fire hydrants shall stand plumb, with the steamer nozzle, if any, facing the street and in accordance with **Standard Drawing No. G-1, and G-2.**

D. Installation of Service Lines

The water main shall be tapped at the service locations shown on the approved plans, and a service line extended to the property line.

Each service line shall be equipped with a corporation stop at the main and curb stop at the property line. The service line may be either laid in open cut or placed by boring and/or jacking. if installed by the open cut method, the trench shall be completely backfilled with compacted sand.

The water service line shall be considered as a part of the main for the purpose of the hydrostatic test as specified in these Standards.

E. Trench Backfill

All the requirements for backfilling of sewer line trenches set forth in **Section VI-3H** shall apply to backfill of water main trenches.

VII-4. FINAL COMPLETION

A. Testing

Each section of the pipe to be tested shall be slowly filled with water, and all air shall be expelled from the pipe. The release of the air can be accomplished by opening hydrants and service line cocks at the high points of the system and the blow-offs at all dead-end. The valve controlling the admission of water into the section of pipe to be tested should be opened wide before shutting the hydrants or blow-offs. After the system has been filled with water and all air expelled, all the valves controlling the section to be tested shall be closed, and the line be allowed to set for a period of not less than 24 hours. All line filling and valve operation shall be done by city water crew or with prior approval of the Water Superintendent.

Final cleaning and testing of water lines shall take place after all construction work is completed, up to, but not including the final paving. Said work to be done in the presence of the Public Works Inspector.

The pipe shall then be refilled, if necessary, and subjected to a pressure of not less than 200 PSI or 50 PSI over the pipe class being installed, whichever is greater, for a period of two hours.

Any cracked or defective pipe, fittings, valves or hydrants discovered during the test shall be removed and replaced with sound material, and the test repeated until the system is proved satisfactory.

The allowable leakage in the test section shall not exceed 100 gallons per mile per 24 hours per diameter of pipe tested.

Example: L = 3240 ft of 8-inch pipe for 2 hour test

$$100 \text{ gallons} \times \frac{3{,}240 \text{ ft}}{5{,}280 \text{ ft/mile}} \times \frac{2 \text{ hours}}{24 \text{ hours}} \times 0.67 \text{ ft (diameter)} = 3.426 \text{ gallons allowable leakage}$$

B. Flushing and Disinfecting

After the pressure test, the system shall be thoroughly flushed out and disinfected in accordance with AIWA Standards and/or the requirements of the County Health Department.

C. Temporary Pavement

In any case where a trench is cut across a street, a temporary minimum 2" thick asphalt plant-mix-cutback surface shall be placed immediately after compacted backfill has been completed, and removed just prior to placing the permanent surfacing material.

D. Replacement of Road Surfaces

PAVING REPLACEMENT SHALL NOT PROCEED UNTIL ALL TESTING, FLUSHING AND DISINFECTING HAVE BEEN PERFORMED TO THE SATISFACTION OF THE CITY ENGINEER. ANY PAVING CONSTRUCTION THAT IS STARTED PRIOR TO COMPLETION OF ALL TESTS AND ACCEPTED BY THE CITY ENGINEER SHALL BE REMOVED AND REPLACED AT CONTRACTOR'S EXPENSE.

E. Clean-up

During the progress of the work, the Contractor shall keep the entire job site in a clean and orderly condition. Excess or unsuitable backfill material, broken pipe, or other waste material shall be removed from the job site. Spillage resulting from hauling operations along or across existing streets or roads shall be removed immediately by the Contractor. All gutters and roadside ditches shall be kept clean and free from obstructions. Any deviation from this practice shall have prior approval from the Engineer.

Before final acceptance of the work, the Contractor shall carefully clean-up the work and premises, remove all temporary structures built by or for him, remove all surplus construction materials and rubbish of all kinds from the grounds which he has occupied and leave them in a neat condition.